

*REMARKS/ARGUMENTS**The Pending Claims*

Claims 1-38 currently are pending. The pending claims are directed to a hybrid structural module and a method of forming the same, wherein the hybrid structural module comprises a tubular fibre composite member, a filled resin system located within said tubular fibre composite member, and at least one elongated steel member located within the filled resin system, wherein the filled resin system binds the steel member and tubular member together.

By way of background, hybrid structural elements differ from standard structural elements in that they use several different materials to carry loads. As such, it is important that the structural role of each different element in the load carrying mechanism is clearly defined. Since load distribution between the different members is determined by their comparative stiffness and strength, it is critical that the requirements for these properties are well defined for each material, as this determines the overall workings of a hybrid structural element.

In addition to critical structural components, hybrid elements may also contain fillers, void formers, and other secondary materials. The role of these materials in the overall load carrying mechanism is of a secondary nature, and as such, their strength and stiffness is not as important and does not have to be specified in any great detail.

In order to understand the structural workings of a hybrid element, and therefore its distinction from other elements, it is critical to distinguish between the primary structural materials and the secondary materials, as well as the force transfer between all these elements. The limitations of each principal material in a hybrid structural element are critical to its overall function.

As described in the specification as filed, the invention recited in independent claims 1 and 33 combines three primary elements: (1) a tubular fibre composite member; (2) a filled resin system; and (3) an elongated steel member, each having a different failure behavior. The combination of features recited in claim 1 advantageously builds redundancy into the

hybrid structural module. As a result, it is extremely unlikely that the three components of the claimed module will fail at the same time (see, e.g., page 8, lines 11-17). Additionally, if one of the three components crack, the crack is unlikely to extend into the other components because cracks have a tendency to follow the interface of different materials rather than traveling straight through them (see, e.g., page 8, lines 18-22).

Importantly, as recited in pending independent claims 1 and 33, the filled resin system binds the steel member and the tubular member together. This has the advantage of making the steel member and the tubular fibre composite member work together as one structural unit. As a result, the claimed invention is a synergistic hybrid member in which the overall load carrying capacity is more than the mere sum of the individual members.

Amendments to the Claims

The claims have been amended to point out more particularly and claim more distinctly the invention. Claim 35 has been amended to clarify that the steel member is either (a) cleaned with a solvent, or (b) etched, or (c) cleaned with a solvent and etched. In addition, the second claim numbered 24 has been cancelled and added as new claim 38.

No new matter has been added by way of these amendments.

The Office Action

The Examiner has objected to the Information Disclosure Statement filed on June 16, 2005. The Examiner also has objected to the specification and claims. Claim 35 has been rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. Claims 1-38 have been rejected under 35 U.S.C. § 103(a) as allegedly obvious over U.S. Patent 3,810,337 (Pollard) (hereinafter "Pollard") in view of U.S. Patent 6,123,485 (Mirmiran et al.) (hereinafter "Mirmiran et al."), U.S. Patent 5,253,458 (Christian) (hereinafter "Christian"), U.S. Patent 5,508,072 (Andersen et al.) (hereinafter "Andersen et al."), U.S. Patent 5,952,053 (Colby) (hereinafter "Colby"), and U.S. Patent 2,925,831 (Welty et al.) (hereinafter "Welty et al.>").

Discussion of the Information Disclosure Statement

References AD, AE, AG, and AH were crossed out on the Form PTO-1449 and were not considered by the Examiner because the articles allegedly were not properly cited. The Examiner has requested that Applicant provides the actual title of the article, the source, and date of publication.

Applicant notes that the Form PTO-1449 submitted on June 16, 2005 properly cited the author, source, volume number (where appropriate), page number, and year for each of references AD, AE, AG, and AH. Applicant respectfully submits that the title of the article is not required. However, for the Examiner's convenience, Applicant has prepared a supplemental Form PTO-1449 (submitted herewith) which reflects the titles of references AD, AE, AG, and AH. As the supplemental Form PTO-1449 contains only references that have been previously submitted to the Office, it is believed that no fee is due; however, the Patent Office is hereby authorized to charge Deposit Account 12-1216 any fee believed to be due as a result of this submission.

Discussion of Objection to the Specification

The Examiner has objected to the specification because the abstract is not presented on a separate sheet of paper. Applicant notes that the MPEP states that, in an international application which has entered the national stage, the applicant need not submit an abstract commencing on a separate sheet if an abstract was published with the international application under PCT Article 21. As noted in the MPEP, the abstract that appears on the cover page of the pamphlet published by the International Bureau (IB) of the World Intellectual Property Organization (WIPO) is the abstract that will be used by the USPTO. See MPEP § 608.01(a).

As the present application is a national stage application of International Patent Application PCT/AU03/01519, Applicant respectfully submits that it is not necessary to present the abstract on a separate page. Nevertheless, as otherwise noted herein, please insert the abstract provided herein on a separate sheet of paper immediately following the claims as page 15. The abstract provided herein is the same as the abstract that appears on the cover

page of the corresponding WIPO publication (WO 2004/044342 A1). Accordingly, no new matter has been added by way of this amendment.

In view of the foregoing, the objection to the specification should be withdrawn.

Discussion of Objection to the Claims

The Examiner has objected to the claims for improper numbering. For the purposes of this Office Action, the Examiner has renumbered the second claim 24 as claim 38. Consistent with the Examiner's renumbering, the second claim 24 has been canceled and added as new claim 38. Therefore, the objection to the claims should be withdrawn.

Discussion of Rejection Under U.S.C. § 112, Second Paragraph

Claim 35 has been rejected as allegedly being indefinite. Specifically, the Examiner contends that the recitation of "and/or" in claim 35 is unclear.

Claim 35 has been amended to clarify that the steel member is either (a) cleaned with a solvent, or (b) etched, or (c) cleaned with a solvent and etched. Applicant submits that amended claim 35 is sufficiently clear, and request the withdrawal of the indefiniteness rejection.

Discussion of Claims 2 and 32

The Examiner contends that the terms "pultruded" and "pre-stressed" recited in claims 2 and 32, respectively, refer to product-by-process language. Applicant respectfully submits that the terms "pultruded" and "pre-stressed" are valid modifiers of the claimed product which impart a further structural limitation to the claims. In particular, the terms "pultruded" and "pre-stressed" are adjectives like, for example, "hardened" and "isolated," and are therefore not process limitations, but are in fact product limitations.

Discussion of Rejection Under U.S.C. § 103(a)

The currently pending claims are directed to a hybrid structural module and a method of forming the same wherein the hybrid structural module comprises:

- (1) a tubular fibre composite member;
- (2) a filled resin system located within said tubular fibre composite member; and
- (3) at least one elongated steel member located within the filled resin system;

wherein the filled resin system binds the steel member and tubular member together.

A. Pollard in View of Mirmiran et al.

Pollard discloses a stressed structural member which comprises a composite of a lightweight void-containing core to which is bonded thin skin sheets on at least some of the lateral surfaces, wherein the core has one or more reinforcing members embedded therein. As noted by the Examiner, Pollard does not disclose or suggest a tubular fibre composite member, as recited in the pending claims.

The Examiner has indicated that Pollard discloses a filled resin system (38) located within a tubular composite member (see Office Action dated August 27, 2008 at page 4). Contrary to the assertions of the Examiner, Pollard does not disclose or suggest a filled resin system, as recited in the pending claims. Instead, Pollard discloses that the structural member comprises a “lightweight void-containing core” which consists of a void-containing material that is preferably formed from a plastic foam (see column 4, lines 3-5). Such a void containing core is *not* a filled resin. In structural engineering there is a distinct difference between a void and a filler. For example, a filled resin system shrinks on curing (unless a special heat expanding particle is used), while a foamed void-containing resin system expands when it cures due to expansion of the air voids resulting from exothermic temperature increases. Moreover, fillers add to the compression strength and stiffness of a structural module, while voids reduce the compression strength and stiffness. Thus, the void-containing core disclosed in Pollard is not a filled resin system, as recited in the pending claims, nor does it function in the same way as a filled resin system.

The currently pending claims are directed to a hybrid structural module wherein the filled resin system binds the steel member and tubular member together. Pollard teaches a

structural member in which reinforcing members (30) and (32) are surrounded by a lightweight void-containing material (38) (see, e.g., Figure 3). Pollard discloses that the lightweight void-containing material, in its final condition, adheres and bonds to the inner surfaces of side (10 and 12), bottom (14), and top (16) skin sheets (see, e.g., column 2, lines 45-47). The lightweight void-containing material is injected into the structural member as a liquid foamable mass such that after foaming the interlocks (18) of the skin sheets are further secured by a thin film of plastic “glue” (see column 2, lines 47-52).

Importantly, the reinforcing members disclosed in Pollard are not bonded to any other member, much less a tubular composite fibre member as recited in the pending claims. Therefore, the composite structural member taught by Pollard does not comprise the features recited in the pending claims, which advantageously work together as one structural unit having an overall load carrying capacity that is more than the mere sum of the individual members.

The structural member taught by Mirmiran et al. has a fiber reinforced plastic composite exterior shell, a cement core, and interior protruding fiber reinforced plastic portions. The disclosure of Mirmiran et al. is directed solely to the use of a concrete composite structure having a cement core. It is well known that one of the major disadvantages of concrete is its significant shrinkage during curing. Hence, when concrete is poured into a composite shell it shrinks away from the shell, leaving a gap between the concrete core and the shell.

Because the invention recited in the pending claims uses a filled resin system that has a low shrinkage, rather than a cement-based core (concrete) as taught by Mirmiran et al., the claimed invention achieves an excellent bond between the composite shell and the core material. Consequently, a major difference between the claimed structural module and the structural module of Mirmiran et al. is the use of a resin-based core compared to a cement-based core, and the associated improved force transfer between the core and the shell.

Furthermore, the structural module taught by Mirmiran et al. is directed to a different application than the hybrid structural module recited in the pending claims. Specifically, the present invention, as recited in the pending claims, is a reinforcement element that can be

used, for example, to reinforce other structural elements such as fibre composite bridge beams. A concrete member with a fibre composite wrap, as taught by Mirmiran et al., is a structural member in its own right and is not meant to be used as a reinforcement element inside other beams.

In view of the foregoing, neither Pollard nor Mirmiran et al. discloses or suggests a filled resin system, much less a filled resin system located within a tubular fibre composite member, as recited in the pending claims. Additionally, neither Pollard nor Mirmiran et al. discloses or suggests the use of a core material that binds to the reinforcing members, let alone a core material that binds an elongated steel member and a tubular fibre composite member together, as recited in the pending claims. Accordingly, the combined disclosures of Pollard and Mirmiran et al. do not disclose or suggest the presently claimed invention.

Moreover, if one of ordinary skill in the art were to combine the disclosures of Pollard and Mirmiran et al. in order to make a structural module, the resulting structural module would be either a module in which (a) a fiber reinforced plastic composite exterior shell surrounds a void containing core having reinforcing members therein, or (b) thin skin sheets surround a cement core having interior protruding fibre reinforced plastic portions. Both combinations are distinct from the claimed invention, and neither combination would achieve the structural advantages of the claimed hybrid structural module.

B. Pollard and Mirmiran et al. in View of Christian, Andersen et al., Colby, and Welty et al.

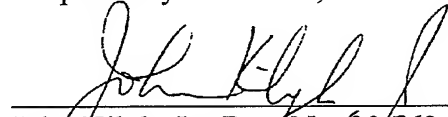
As discussed above, the combined disclosures of Pollard and Mirmiran et al. do not disclose or suggest a hybrid structural module having the features recited in the pending claims. Christian, Andersen et al., Colby, and Welty et al., do not compensate for the deficiencies of Pollard and Mirmiran et al. In particular, none of the cited references discloses or suggests a filled resin system located within a tubular fibre composite member, much less a filled resin system that binds the steel member and the tubular member together, as recited in the pending claims.

In view of the foregoing, the present invention, as recited in the pending claims, is not obvious over the combination of cited references, and the obviousness rejection should be withdrawn.

Conclusion

Applicant respectfully submits that the patent application is in condition for allowance. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,



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